

REMARKS

This is in response to the Office Action dated December 3, 2004. Claims 1-40 are pending.

The drawings and abstract have been amended as suggested by the Examiner, for formality purposes.

General

Generally speaking, for purposes of example only and without limitation, certain example embodiments of this invention relate to a recording disc to be used in a thermally assisted recording system. As shown in Fig. 11, recording takes place via an amorphous magnetic layer in an area of overlap 113 between a laser spot or heat region 112 and a magnetic field region 111. When crystalline discs are used conventionally, a crystal grain boundary exists between recording bits so that magnetic wall movement hardly occurs (pg. 8, lines 4-8; and pg. 9, lines 2-4). However, when amorphous magnetic layers are used, the recording bits are not separated by crystal grain boundaries (pg. 8, lines 8-12). As a result, in the case of amorphous magnetic layers, magnetic wall movement is a significant problem leading to deterioration of signal quality (pg. 8, lines 1-3 and 12-18). This is particularly problematic in thermally assisted recording system when heat is used (e.g., pg. 7, lines 12-20).

To solve this problem in magnetic discs having amorphous magnetic layers, certain example embodiments of this invention provide bumps on a surface of the amorphous magnetic layer in a manner such that the *density of the bumps is not less than 400 bumps/ μm^2* . Moreover, in certain example embodiments of the instant invention, the height of the bumps is not less than 2% with respect to an average layer thickness of the magnetic layer. Therefore, even in a case of

performing high-density recording by forming a minute recording bit, it is possible to record information with sufficient signal quality.

Claim 1 – Art Rejection (see also claims 13, 25, 29, 33 and 37)

Claim 1 stands rejected under 35 U.S.C. Section 103(a) as being allegedly unpatentable over Nakajima in view of Tanaka. This Section 103(a) rejection is respectfully traversed for at least the following reasons.

Claim 1 requires that “the **magnetic layer has bumps on a surface thereof, and density of the bumps is not less than 400 bumps/ μm^2** .” The cited art fails to disclose or suggest this.

Nakajima discloses a thermally assisted magnetic recording system, where a disc having an amorphous magnetic layer is used. However, the Examiner admits that Nakajima fails to disclose or suggest the bumps required by claim 1. Recognizing this deficiency in Nakajima, the Examiner cites Tanaka.

Tanaka discloses a recording disc including a magnetic layer 4 which may have protrusions formed thereon (e.g., col. 5, lines 59-65). However, Tanaka states that the density of the protrusions does not exceed 250,000/mm² (i.e., *does not exceed 0.25 protrusions/ μm^2*) – which is *outside* of the claimed range recited in claim 1. As is readily calculable by one of ordinary skill in the art:

$$\begin{aligned} 1 \text{ mm}^2 &= 1000 \mu\text{m} \times 1000 \mu\text{m} \\ &= 1,000,000 \mu\text{m}^2 \\ \text{hence} \quad 250,000 \text{ protrusions/mm}^2 &= 250,000/1,000,000 = 0.25 \text{ protrusions}/\mu\text{m}^2 \end{aligned}$$

In view of the above, it can be clearly seen that Tanaka states that the density of the protrusions does not exceed 0.25 protrusions/ μm^2 – which is well *outside* of the claimed range recited in claim 1. Thus, even if the two references were combined as alleged in the Office

Action (which would be incorrect in any event), the invention of claim 1 still would not be met. It is further noted that the fact that Tanaka states that bumps have a width of about 2 μm each confirms the fact that the bump density in Tanaka cannot possibly be not less than 400 bumps/ μm^2 as called for in claim 1 (e.g., col. 8, lines 23-24).

Furthermore, it is clear that the density of protrusions disclosed by Tanaka (well outside the range of claim 1) is needed in Tanaka to achieve the objective in Tanaka. Namely, the bump density is needed to ensure floating stability of the head and a reduction in frictional forces (e.g., see col. 9, lines 32-45). Thus, one of ordinary skill in the art would never have modified Tanaka to meet the invention of claim 1, and there is clearly no suggestion or motivation in the cited art for doing so.

The Section 103(a) rejections of independent claims 13, 25, 29, 33 and 37 is flawed in a similar manner to that discussed above with respect to claim 1. Thus, independent claims 13, 25, 29, 33 and 37 also clearly define over the cited art.

Claim 7

Claim 7 as amended requires that "height of the bumps on a surface of the magnetic layer is not less than 2% with respect to an average layer thickness of the magnetic layer, and the bumps propagated through to the surfaces of the subsequent layers are provided with a shape different to that of the bumps on the surface of the magnetic layer." E.g., see page 29, lines 6-10, or the instant specification. This feature is advantageous in that bumps can be on the magnetic layer for providing sufficient pinning to suppress or reduce magnetic wall movement, and at the same time there is ability to propagate the shape of the bumps on subsequent layers (e.g., protective layer and/or lubricating layer) so as to improve a sliding and/or surfacing property thereon (e.g., see from pg. 29, line 6 to pg. 30, line 6).

The cited art fails to disclose or suggest the aforesaid underlined aspect of claim 7. In particular, in contrast with the invention of claim 7, Tanaka requires that the protrusions maintain the same shape and height through the layers so that the same shaped protrusions are formed for all layers (e.g., col. 18, lines 50-53; and Fig. 3). Thus, it can be seen that Tanaka teaches directly away from the invention of claim 7.

The Section 103(a) rejections of independent claims 19, 27, 31, 35 and 39 is flawed in a similar manner to that discussed above with respect to claim 7. Thus, these claims also clearly define over the cited art.

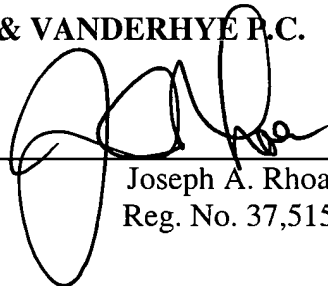
Conclusion

For at least the foregoing reasons, it is respectfully requested that all rejections be withdrawn. If any minor matter remains to be resolved, the Examiner is invited to telephone the undersigned with regard to the same.

Respectfully submitted,

NIXON & VANDERHYTE P.C.

By: _____



Joseph A. Rhoa
Reg. No. 37,515

JAR:caj
1100 North Glebe Road, 8th Floor
Arlington, VA 22201-4714
Telephone: (703) 816-4000
Facsimile: (703) 816-4100

AMENDMENTS TO THE DRAWINGS

The attached sheets of drawings include changes to Figs. 1 and 11. These sheets, which include Figs. 1 and 11, replace the original sheets including Figs. 1 and 11. In Figure 1, “magnetic recording area” has been deleted next to reference numeral 1. In Fig. 11, reference numeral 115 has been added for the track.

Attachment: 2 Replacement Sheets